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Canada

BIOFUELS ANNUAL

Biofuels Annual - Canada

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Report Highlights:

Canada's has a patchwork of provincial mandatory renewable fuel mandates but the federal mandate of an annual renewable content of five percent in the gasoline pool by 2010, and a two percent requirement for renewable fuel in diesel content by 2012 remains somewhat elusive. Current estimates suggest the ethanol mandate will be in effect in September 2010 and biodiesel in 2011. In 2009, total domestic ethanol production capacity is estimated to reach 1.42 billion litres in 2009 (approximately 3.6 % of gasoline pool) compared to 2008's 1.39 billion litres. In 2009, it is estimated that 69% of the production capacity for domestic ethanol will be derived from corn, 30% from wheat and 1% from "other" feedstock such as wood waste and wheat straw. Post forecasts that this will likely change to 75% corn, 23% wheat and 2% "other" feedstock by the end of 2010. Overall Canada's limited bio-fuel production capacity, both in the short and medium term suggests that Canada's entry into the global ethanol market is still quite distant.

Post:
Ottawa

Commodities:
select

Executive Summary:
1. Executive Summary

Canada's has a patchwork of provincial mandatory renewable fuel mandates but the timeline for the details and exact implementation date of the federal mandate of an annual renewable content of five percent in the gasoline pool by 2010, and a two percent requirement for renewable fuel in diesel content by 2012 remains somewhat elusive. Current estimates are that the proposed regulations will be published in the fall of 2009 for comment. The regulations may then be modified based on the comments received and published a second time in June 2010. If this scenario holds, the ethanol section of the mandate would go into effect in September 2010 with the two percent biodiesel mandate expected to follow in sometime in 2011.

Meanwhile, three provinces representing roughly 46 percent of total net gasoline sales in Canada have ethanol mandates. These mandates include 7.5 percent mandate in Saskatchewan and 5 percent mandates in Manitoba and Ontario. The provinces of British Columbia and Alberta are scheduled to bring in 5 percent renewable fuel mandates in their gasoline pools in 2010 and together account for 24 percent of net gasoline sales in Canada. Quebec is contemplating a 5 percent renewable fuel content in its gasoline pool for 2012 and accounts for 23 percent of net gasoline sales in Canada.

In 2009, total domestic ethanol production capacity is estimated to reach 1.42 billion litres in 2009 (approximately 3.6 % of gasoline pool). This represents only a small increase (1.8%) over year 2008 domestic production capacity levels of 1.39 billion litres.

Should the projects under construction be realized, Canadian production is expected to reach 1.931 billion litres by the end of 2010, a production capacity that meets the government of Canada's target of 1.9 billion litres. In contrast, Canada's biodiesel industry has seen a jump in production capacity in 2009 but remains far from the 600 million litres of biodiesel required to meet the federal mandate. By the end of 2009, domestic production capacity of biodiesel is expected to reach 216 million litres, a 71% increase over the 2008 production capacity of 126 million litres.

In 2009, it is estimated that 69% of the production capacity for domestic ethanol will be derived from corn, 30% from wheat and 1% from "other" feedstock such as wood waste and wheat straw. Post forecasts that this will likely change to 75% corn, 23% wheat and 2% "other" feedstock by the end of 2010 should the planned plants be in operation by the end of 2010.

For biodiesel, in 2009, 49% of the production capacity is estimated to be tallow-based (an increase from 36% in 2008), 37% yellow grease-based (a decrease from 59% in 2008) and 14% canola-based, an increase from 2008 levels where canola-based biodiesel accounted for 6% of the production capacity. By 2010 Post forecasts that tallow, yellow grease and canola derived biodiesel production capacity will account for 46%, 37% and 17%, respectively.

Canada's limited bio-fuel production capacity, both in the short and medium term suggests that

Canada's entry into the global ethanol market is still quite distant. While the possibility of increased ethanol trade, especially between the northwest United States and Western Canada (wheat-ethanol to the United States and corn-based ethanol to Canada), is unlikely to develop in the short to medium term, there is an increasing amount of trade taking place in the co-products of ethanol production.

Author Defined:

2. Domestic Environment

A. Proposed National Biofuels Mandate

In late 2006 Canada's government a renewable fuels strategy, including a national renewable fuels mandate. Since that time, work to bring about the legislative amendments necessary have been brought forth and federal and provincial incentive programs encouraging the development of a Canadian renewable fuels industry have been put in place. A [Notice of Intent](#) was published in the Canada Gazette Part 1 on December 30th, 2006 detailing the government of Canada's intentions in terms of federal regulations requiring renewable fuels. The mandate calls for an annual renewable content of five percent in the gasoline pool by 2010, and a two percent requirement for renewable fuel in diesel content by 2012, upon the successful demonstration of renewable diesel fuel under the range of Canadian climatic conditions. Since fuel regulations are a shared federal/provincial jurisdiction, provincial endorsement of such a mandate is necessary. Most provinces have, or plan to have, a provincial renewable fuel mandate in place and most support the national mandate proposal.

B. Legislation Underpinning a Canadian Biofuels Mandate

In order for the government to be able to bring in a renewable fuels content mandate, amendments to the Canadian Environmental Protection Act, 1999 were necessary. [Bill C-33](#), which received royal ascent in late June 2008, amended the Fuels Division (Division 4) of the Canadian Environmental Protection Act of 1999 (CEPA, 1999). These amendments added to the regulation-making power of the federal Cabinet by allowing it to make regulations concerning blended fuels. In addition, the amendments allow for the federal cabinet, on recommendation by the Environment Minister, to make regulations exempting producers or importers of fuel who produced or import a quantity less than 400 meters cubed (m³) per year.

C. Impatience with the Lack of Regulatory Certainty

At the time of this report, industry sources state that regulations for the new federal renewable fuel standard are about six months behind schedule. Industry sources indicate that the proposed regulations would be published in the fall of 2009 for comment. The regulations may then be modified based on the comments received and published a second time in June 2010.

The ethanol mandate is expected to go into effect in September of 2010.

While political support for the bio-fuels mandate remains strong since it is viewed as a vehicle to help revitalize rural communities, some industry stakeholders have expressed impatience with the delay in the publication of a clear regulatory design with regards the renewable fuel standard. Some industry stakeholders have expressed concerns on whether or not a smooth transition to 5 percent ethanol in the gasoline pool is possible. The Canadian Petroleum Products Institute (CPPI) expressed concerns that since much of the compliance path determination by individual companies depends on the details of regulatory design, the delay in the publication of the federal regulations has hampered the petroleum's industry to make the necessary adjustment. CPPI even suggested that the renewable fuel standard for ethanol/gasoline and biodiesel be delayed until 2012, something governmental sources say will not happen. Representatives from the Canadian Renewable Fuels Association (CFRA) take the opposite view and urge the Canadian government to maintain and expand its support for the biofuels industry and called for an accelerated process to implement and enforce the national renewable fuels standard. The CFRA also asked that the programs be less complicated so that potential investor uncertainty is avoided. A full transcript of these comments to a parliamentary committee is available at the following web-address: [Bio-fuels and competitiveness of Canadian agriculture](#).

D. Federal Programs to Encourage the Development of a Canadian Renewable Fuels Industry

The excise tax exemption for renewable fuels was eliminated April 1, 2008. In addition to this change, the Canadian government put in place several programs designed to promote the development of a domestic renewable fuels industry. Several of the programs are designed to encourage agricultural producer involvement and the usage of agricultural biomass.

Table 2.1 Federal Programs to Promote a Domestic Renewable Fuels Industry			
Program Name	Budget Allocated / Administering Ministry or Agency	Type of Program	Program Design / Duration

EcoEnergy for Biofuels Overview	<ul style="list-style-type: none"> • C\$1.5 billion ; Administered by Natural Resources Canada 	<ul style="list-style-type: none"> • Production incentive program (subsidy); production capacity building 	<ul style="list-style-type: none"> • Provides incentive rates of up to \$0.10/liter (L) for renewable alternatives to gasoline and \$0.20/L for renewable alternatives to diesel for the first three years, declining in the 6 years thereafter; Program runs April, 2008 - March 31, 2017
Biofuels Opportunities for Producers Initiative	<ul style="list-style-type: none"> • C\$20 million; Administered by Agriculture and Agri-food Canada; funding delivered through regional industry councils 	<ul style="list-style-type: none"> • Direct payment, encourage producer ownership / involvement 	<ul style="list-style-type: none"> • Provides financial assistance to develop bio-fuel feasibility studies (suitability of bio-fuel production in local community) and business plans; funding was available for projects with greater than one-third producer ownership; Closed on March 31, 2008
ecoAGRICULTURE Biofuels Capital Initiative	<ul style="list-style-type: none"> • C\$200 million; Administered by Agriculture and Agri-Food Canada 	<ul style="list-style-type: none"> • Loan (repayable contributions) 	<ul style="list-style-type: none"> • Encourages producer equity/ownership in bio-fuel facilities. The program helps fund projects that use agricultural feedstock to produce bio-fuels and requires agricultural producer equity investments of 5% to meet the eligibility requirements. The funding increases as producer investment increases, however a contribution cap of C\$25 million applies; In effect April, 2007 - March 31, 2011
Agricultural Bio-products Innovation Program (ABIP)	<ul style="list-style-type: none"> • C\$145 million; Administered by Agriculture and Agri-food Canada 	<ul style="list-style-type: none"> • Grants 	<ul style="list-style-type: none"> • Seeks to mobilize research networks that conduct scientific research projects with a specific focus on developing effective and efficient technologies for an agricultural biomass conversion; evolve beyond bio-fuels production to a sustainable, bio-based economy; Program runs multi-year

Agri-Opportunities Program	<ul style="list-style-type: none"> • C\$134 million; Administered by Agriculture and Agri-Food Canada 	<ul style="list-style-type: none"> • Loans (repayable contributions) 	<ul style="list-style-type: none"> • To accelerate the commercialization of new agricultural products, processes or services that are currently not produced or commercially available in Canada and that are ready to be delivered to the marketplace with focus on projects geared to new agri-food, agriculture or bio-products; Program runs April 2006 - March 31, 2011
NextGen Biofuels Fund	<ul style="list-style-type: none"> • C\$500 million; Administered by Sustainable Development Technology Canada 	<ul style="list-style-type: none"> • Loans (repayable contributions) 	<ul style="list-style-type: none"> • To increase production capacity of 2nd generation bio-fuels; to spur investment with the private sector in establishing large-scale facilities for the production of next-generation renewable fuels, to address the gap between demonstration and commercialization; Program runs April 2006 - March 31, 2011

E. Provincial Mandates and Programs to Encourage Renewable Fuels Industry Development

Provinces have led the way in terms of developing mandates on renewable fuel contents. However, inconsistencies in provincial requirements may frustrate the flow of bio-fuel trade within Canada. There is concern that with each provincial government implementing its own complex and un-harmonized set of production and/or consumption incentives with differences in eligibility and duration has created barriers to trade and may encourage production in areas where this activity is not well suited. In addition, in the absence of a federal mandate, is confusing for the petroleum industry which is struggling to know how to organize itself. Canada's refinery industries are mostly in western Canada (Alberta) and on the east coast (Newfoundland and Labrador) while the urban centers are in central Canada (Quebec and Ontario). Within the Notice of Intent, the federal government makes note of these barriers and sees the federal mandate as a means to work with provinces at harmonizing provincial mandates to eliminate inter-provincial trade barriers. However, given the lead time the provinces have in developing their provincial regulations, the ability of the federal government to carry out this role is unclear.

Several provinces have implemented provincial mandates on the amount of ethanol required in the gasoline pool. Certain provinces have also brought in legislation and regulations that will

result in a renewable fuel standard for diesel fuel that will likely come into force ahead of the federal biodiesel mandate. Table 2.2 summarizes the incentive measures provinces that are currently in effect:

Table 2.2 Provincial Mandates, Tax Exemptions, Incentives, and Conditions		
ALBERTA		
Mandate	Incentives	Conditions/Duration
Intends to mandate a renewable fuel standard of 5% ethanol content in gasoline and 2% per cent renewable content in diesel by 2010.	<u>Renewable energy producer credit:</u> The producer credit amount is \$0.09/L for production from plants with a capacity of 150 million liters or more a year. For plants with capacity of less than 150 million liters per year, the credit amount is \$0.14/L	<u>Conditions:</u> In order to be eligible for the renewable energy producer credit, the product must be produced at a facility located in Alberta. <u>Duration:</u> The credit program runs from April 1, 2007 – March 31, 2011.
BRITISH COLUMBIA		
Mandate	Incentives	Conditions/Duration
Intends to mandate a 5% renewable fuel content in the gasoline and diesel supply pools in 2010.	<u>Excise Fuel Tax Exemption:</u> The ethanol and biodiesel portion of the motor fuel (use in internal combustion engine) is exempt from the provincial fuel tax and is also exempt from the province's new carbon tax. Biodiesel fuel used for non motor purposes (residential or commercial) is exempt from the provincial sales tax. B.C. offers a full rebate (14.5 cents per liter) on E85 to E100 blends.	<u>Conditions:</u> As of July 1, 2004, the ethanol portion , including denaturant, of an ethanol/gasoline or gasoline/diesel blend is exempt from tax if the ethanol portion is not less than 5% or more than 25% of the volume of the blend. Effective February 20, 2008, ethanol used as colored fuel, marine diesel, locomotive fuel, jet fuel or aviation fuel is exempt from tax. This includes the portion used in any biodiesel fuel blend and any ethanol blend in which the ethanol portion is from 5% to 25% . Previously, ethanol was only exempt from tax when used in motor vehicles on a highway. <u>Duration:</u> No duration specified.
	<u>Carbon Tax Exemption</u> Ethanol and biodiesel are exempt under the Carbon Tax Act.	<u>Duration:</u> No duration specified

MANITOBA		
Mandate	Incentives	Conditions/Duration
5% pool average ethanol content in gasoline from January 1, 2008 – March 31, 2008; 8.5% pool average ethanol content in gasoline beginning April 1, 2008 Plans to bring in a biodiesel mandate in 2010.	<u>Direct Payment Production Incentive</u> 20 cents/liter producer incentive beginning January 1, 2008 until Dec 31, 2009. 15 cents/liter producer credit from January 1, 2010 -December 31, 2012 10 cents/liter from January 1, 2013 - December 31, 2015.	<u>Condition:</u> To be eligible for the credit, the ethanol has to be produced and sold in Manitoba. The incentive is capped on an annual basis by the amount of ethanol required for the mandate. <u>Duration:</u> January 1, 2008 – December 31, 2015.
	<u>Excise fuel tax exception for E10</u> 2.5 cents per liter tax exemption on E10 blends. Provincial fuel tax rate is 11.5 cents per liter.	<u>Conditions:</u> To be eligible for the provincial excise tax exemption, the ethanol blend must be E10 produced and sold within the jurisdiction. <u>Duration:</u> No specific duration

ONTARIO		
Mandate	Incentives	Conditions/Duration
All gas sold must contain 5% ethanol, beginning in January 2007; Amount increase to 10% by 2010 (still tentative)	None	None

QUEBEC		
Mandate	Incentives	Conditions/Duration
None, but provincial government is considering a 5% bio-fuel content mandate in its gasoline pool by 2012.	<u>Tax Credit Refund</u> On April 21, 2005, the government announced a refundable tax credit, to be granted for a maximum of 10 years, to corporations that produce ethanol from renewable material and sell the ethanol for use in Québec.	<u>Conditions:</u> To be eligible for the exemption, the ethanol must be produced and sold in Quebec Additional conditions to be entitled to the credit is that the tax credit is limited to a maximum ethanol production credit of 126 million liters and <i>no tax credit is given for the month in which the average monthly price of crude oil is equal to or greater than US\$65 a barrel</i>

		<i>or the total cumulative production of ethanol exceeds 1.2 billion liters</i> Duration: April 1, 2006 - March 18, 2018
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SASKATCHEWAN		
Mandate	Incentives	Conditions/Duration
All gas sold must contain 7.5% ethanol, began mid-2006.	Ethanol Fuel Grant Program Grants for eligible fuel distributors.	Conditions: The ethanol must be produced and consumed in Saskatchewan. Duration: No duration specified.

(i) Alberta Biofuel Policies

Biofuels Strategy/Policy Documents:

The build up of biofuels production capacity in Alberta has largely been the result of its nine-point bioenergy plan, first announced in October 2006. In December 2008, the government built on this plan and announced its [Provincial Energy Strategy](#).

Renewable Fuel Standards:

As part of the strategy, the government of Alberta announced its intention to implement a renewable fuel standard of 5% ethanol content in gasoline and 2% renewable content in diesel by 2010. In addition, to meet the standard, the greenhouse gas emissions over the production and manufacturing life cycle of the renewable fuel must be at least 25% lower than emissions from producing and manufacturing the same quantity of traditional fossil fuels.

Production Incentives:

As mentioned in Table 2.2, the province of Alberta offers a renewable energy producer credit. For more information on the program see the following link:

[Renewable Energy Producer Credit Program](#)

Table 2.3		
Alberta: Provincial Programs to Encourage the Development of a Biofuels Industry		
Program name:	Bioenergy Infrastructure Development Grant Program	Commercialization/Market Development Program
Budget Allocation:	C\$ 6 million	C\$ 24 million
Administering Ministry or Agency	Alberta Energy	Alberta Energy
Type of Program:	Financing grant	Financing grant

Program Design or Purpose:	To assist municipalities with the development and distribution infrastructure of biofuels and energy.	Designed to increase production capacity through the market development and commercialization of biofuels.
Duration	Began April 1, 2008 and originally was to end March 31, 2009 but extended to March 31, 2011	Began April 1, 2008 and originally was to end March 31, 2009 but extended to March 31, 2011
Additional notes:	Some program modifications due to its extension. For more on how this affects the programs see FAQs .	Some program modifications due to its extension.

Context: According to the most recent data, Alberta boasts approximately 13% of Canada's total population, 11% of net gasoline sales and 3% of ethanol production capacity.

(ii) British Columbia Biofuel Policies

Biofuels Strategy/Policy Documents:

In 2007/2008, the province of British Columbia (BC) committed to bioenergy and renewables and set an objective to lower greenhouse gases emissions by 33 percent by 2020. The province, under its Ministry of Energy, Mines and Petroleum Resources, unveiled 2 strategy documents/plans related to using bioenergy resources to reduce greenhouse gases. The first is the [BC Energy Plan](#), unveiled late February 2007. This document sets out the necessary steps for reducing BC's greenhouse gas emissions and commits to investments in alternative technologies, including biofuels for transportation. The second is the [BC Bioenergy Strategy](#) which was made public at the end of January 2008.

Renewable Fuel Standard:

The [BC Energy Plan](#) includes the implementation of a 5% average renewable fuel standard for diesel (higher than the anticipated federal mandate of 2%), and supports the federal action of increasing the ethanol content of gasoline to 5% by 2010. Underpinning the commitment for a renewable fuels mandate for transportation fuels is the [Greenhouse Gas Reduction \(Renewable and Low Carbon Fuel Requirements\) Act](#) which received royal assent on May 1, 2008. The regulations for this act were published in December 2008.

Consumption Incentives: Motor Fuel Tax Act and Carbon Tax Incentive

The consumption incentives for ethanol and biodiesel are in the form of tax exemptions. BC has both a tiered motor fuel tax and a carbon tax. The [Motor Fuel Tax Act](#) sets out the exemptions for ethanol and biodiesel. Effective July 1, 2004, the ethanol portion, including

denaturant, of an ethanol/gasoline or gasoline/diesel blend is exempt from tax if the ethanol portion is not less than 5% or more than 25% of the volume of the blend. Effective February 20, 2008, ethanol used as coloured fuel, marine diesel, locomotive fuel, jet fuel or aviation fuel is exempt from tax. This includes the portion used in any biodiesel fuel blend and any ethanol blend in which the ethanol portion is from 5% to 25%. Previously, ethanol was only exempt from tax when used in motor vehicles on a highway. Ethanol blends greater than 85% are 100% exempt.

Effective February 21, 2007, biodiesel is exempt from tax when used on-highway. This exemption includes the biodiesel portion of any blend of biodiesel and diesel fuel, as well as pure biodiesel (B100). Effective February 20, 2008, biodiesel used as coloured fuel, marine diesel, locomotive fuel, jet fuel or aviation fuel are exempt from tax. This includes the portion used in any biodiesel fuel blend and any ethanol blend in which the ethanol portion is from 5% to 25%. Previously, biodiesel was only exempt from tax when used in motor vehicles on a highway.

The [Carbon Tax Act](#) is the legislation that sets out the low carbon fuel requirement for a 10% reduction in carbon content of fuel by 2010. BC's new carbon tax came into effect on July 1, 2008. Under the Carbon Tax Act, the renewable fuel portions of blended motor fuel are exempt from taxation. It is expected that the low carbon requirement will increase the demand for biofuels.

Table 2.4		
British Columbia: Programs to Promote a Provincial Renewable Fuels Industry		
Program Name	Budget Allocated / Administering Ministry or Agency	Type of Program/ Program Design / Duration
BC Bioenergy Network	C\$ 25 million Ministry of Energy, Mines and Petroleum Resources; BC Bioenergy Network	<ul style="list-style-type: none"> ▪ Grant; funding assistance ▪ Capacity building; to encourage the development and marketing of wood-to-bioenergy and other bioenergy technologies ▪ Began April 1 2008 and has no specific end date <p><i>Additional note: The projects funded so far include 1.82 million \$Can in funding assistance to Lignol Energy Corporation, 3 million \$Can to Nexterra, and 400 thousand \$Can to Cedar Road, \$100,000 investment in University of British Columbia's Clean Energy Research Centre (CERC)</i></p>
Liquid Biofuels Program	C\$ 10 million Ministry of Technology, Trade and Economic	<ul style="list-style-type: none"> ▪ Grants, funding assistance ▪ To help build up liquid biofuels production capacity ▪ Call for applications went out late November, 2008, and application date closed January 2009 <p><i>Additional note: Projects that were awarded funding were announced in April 2009. Two of the eight projects are</i></p>

	Development	<i>projects which use woody biomass to produce cellulosic ethanol. The remaining six projects are for biodiesel production. For more information on these projects, see: Approved Liquid Biofuels Projects.</i>
Innovative Clean Energy Fund	C\$ 25 million per year Ministry of Technology, Trade and Economic Development	<ul style="list-style-type: none"> • Grants, funding assistance • To address specific energy and environmental problems that have been identified by the province by supporting the pre-commercial energy technology that is new or commercial technologies not currently used in the province (note: the funding is not specific to biofuels, but alternative fuel technologies are eligible) • Originally established in December 2007, originally to run two years, has been extended another 3 years, ends in 2011 <p><i>Additional note: The first round of funding was been awarded/announced in July 2008. For more information on these projects, see: ICE Fund Project Round One</i></p>

Context: According to the most recent data, British Columbia boasts approximately 11% of Canada's total population, 13% of net gasoline sales and virtually no commercial ethanol production capacity.

(iii) Manitoba Biofuel Policies

Biofuels Strategy/Policy Documents:

Manitoba is developing its ethanol and biodiesel industries under the Energy Development Initiative section of the Ministry of Science Technology Energy and Mines. Information on Manitoba's biofuels initiatives is available on the province's [Energy Development Initiative](#) website.

Renewable Fuels Mandate:

The implementation of [The Bio-fuels and Gasoline Tax Amendment Act](#) was enacted in the fall of 2007. The mandate requiring that 8.5% of the gasoline pool contain ethanol came into effect on January 1, 2008, beginning with a 5% ethanol content requirement for the first quarter of the year and moving to 8.5% for the remainder of 2008 and subsequent years. Manitoba is also preparing for the implementation of a biodiesel mandate in 2010. In December, 2007 the Province of Manitoba passed the new [The Biofuels Act](#). The new legislation sets out Manitoba's biodiesel program which includes strict licensing and fuel quality requirements and the option for a future biodiesel mandate. Details of the licensing requirements as well as the application for biodiesel producers can be found on the website of the [Manitoba Biodiesel Energy Office](#) website.

Production Incentives:

The gasoline tax exemptions for ethanol have been replaced by a direct producer grant that decreases over a period of eight years. The staggered, decreasing production incentives are as follows: 20 cents/liter producer incentive beginning January 1, 2008 until December 31, 2009; 15 cents/liter production incentive beginning January 1, 2010 until December 31, 2012; 10 cents/liter producer incentive beginning January 1, 2013 until December 31, 2015. To be eligible for the incentive, ethanol must be produced in Manitoba and sold in Manitoba to fuel suppliers. More information on the program is available at: [Ethanol Fund Grant Regulation](#).

Context: According to the most recent data, Manitoba boasts approximately 3% of Canada's total population, 4% of net gasoline sales and 9% of ethanol production capacity.

(iii) Saskatchewan Bio-fuel Policies

Biofuels Strategy/Policy Documents:

Saskatchewan is also going forward with its "[Go Green](#)" strategy. The strategy promotes environmentally friendly transportation. Initiatives include working with industry to develop E85 (fuel blends with 85% ethanol and 15% gasoline) corridors in the province, developing a 1.4 billion liter biofuels industry in Saskatchewan, and implementing a Government and Crown vehicle purchase policy that requires all vehicles to be hybrid electric, alternative or flex-fuel, or within the top 20 per cent efficiency in their class.

Renewable Fuels Mandate:

Saskatchewan currently has a 7.5% ethanol content requirement in its gasoline.

Production Incentives:

Saskatchewan does not provide fuel tax exemptions for alternative fuels but does provide grants to fuel distributors through the [Ethanol Fuel Grants Program](#). To be eligible for the grants, the ethanol used by the distributor has to have been produced at a facility located in Saskatchewan from biomass grown in Saskatchewan.

The Saskatchewan Ministry of Agriculture administers the [Saskatchewan Ethanol Program](#).

Table 2.5 Saskatchewan: Programs to Promote a Provincial Renewable Fuels Industry		
Program Name	Budget Allocated / Administering Ministry or Agency	Type of Program/ Program Design / Duration
SaskBio	C\$ 80 million	<ul style="list-style-type: none"> Loans, repayable contributions of up to 10 million dollars Created to provide an opportunity for Saskatchewan residents to participate

	Ministry of Agriculture	<p>in value-added biofuel production in Saskatchewan through investment ownership in biofuels facilities</p> <p>•Began December 2008, end date December 2012</p> <p><i>Additional note:</i> program conditions includes 5% Saskatchewan ownership and annual production capacity of a new facility of 2 million liters per year</p>
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Context: According to the most recent data, Saskatchewan boasts approximately 3% of Canada's total population, 3% of net gasoline sales and 24% of ethanol production capacity.

(iv) Ontario Biofuel Policies

Biofuels Strategy/Policy Documents:

Ontario is the largest ethanol-producing province in Canada and has been a leader in building ethanol production capacity in Canada. Its ethanol strategy has two components; (1) a renewable fuel standard mandate, and (2) the [Ontario Ethanol Growth Fund](#) (OEGF) that was created in 2005.

Renewable Fuels Standard:

As of January 1, 2007, the gasoline tax exemption of 14.7¢ a liter on the ethanol portion of the ethanol-blended gasoline was no longer in effect. At the same time, a mandate that requires an average of 5% ethanol be blended in the gasoline sold in Ontario came into effect.

Provincial Programs to Support the Development of a Regional Biofuels Industry:

The [Ontario Ethanol Growth Fund](#) (OEGF) provides:

- C\$32.5 million for capital assistance to help meet financial challenges; cannot exceed 10¢ per liter
- C\$60.5 million per year from 2007-2017 for operating assistance to address changing market prices; no operating grant will exceed 11¢ per liter of ethanol
- C\$16 million in support of independent retailers selling ethanol blends; Independent Gasoline Blender's Transition Fund,
- C\$7.5 million in private and public funds for research and development opportunities

Context: According to the most recent data, Ontario boasts approximately 39% of Canada's total population, 40% of net gasoline sales and 55% of ethanol production capacity.

(v) Quebec Biofuel Policies

Biofuels Strategy/Policy Documents:

Quebec currently has no mandate in place for renewable fuel content in gasoline. The provincial government is considering a 5% bio-fuel content mandate in its gasoline pool by 2012. More information on Québec's ethanol initiative is available on the following website: <http://www.mrnf.gouv.qc.ca/english/energy/sources/sources-biomass.jsp>

Production Incentives:

Quebec currently has in place a temporary refundable tax credit (maximum \$0.185 per liter), to be granted for a maximum of 10 years, to corporations that produce ethanol from renewable material and sell the ethanol for use in Québec. It began April, 2006 and expires in 2018. An eligible corporation's ethanol production must be sold in Quebec to a person holding a collection officer's permit issued under The Fuel Tax Act. Additional conditions to be entitled to the credit is that the tax credit is limited to a maximum ethanol production credit of 126 million liters and no tax credit is given for the month in which the average monthly price of crude oil is equal to or greater than US\$65 or the total cumulative production of ethanol exceeds 1.2 billion liters. The reasoning for this limitation is that it was assumed that ethanol would be competitive with gasoline if the price of crude oil exceeded 65\$US a barrel. More information is available on the web site of Revenue Quebec.

While some corn production takes place in Quebec, Quebec's focus is on the development of cellulosic ethanol. It is Quebec's intention to use wood from its forestry industry to grow its ethanol market. This technology seems to be moving closer to commercialization given the recent joint venture announcement between [Enerkem](#), a Quebec-based gasification and catalysis technology company, and Greenfield Ethanol, Canada's leading ethanol producer.

Context: According to the most recent data, Quebec boasts approximately 23% of Canada's total population, 21% of net gasoline sales and 9% of ethanol production capacity.

(vi) Biofuel Policies in Atlantic Canada

Biofuels Strategy/Policy Documents:

The biofuels sector has struggled to establish a presence in the Atlantic Provinces due to a lack of provincial government support and a lack of biofuel initiatives. Several Atlantic provincial governments have begun looking over their energy strategies and are struggling to evaluate the feasibility of a renewable energy industry for their respective provinces. No unified biofuel strategy has yet been unveiled. One of the key organizations pushing for the development of a biofuels industry is the [Atlantic Bioenergy Taskforce](#). Atlantic Canada renewable fuels will likely focus on technologies that use wood residue as feedstock

3. Energy Markets

A. Energy Production and Consumption Patterns

Unlike the United States, energy security is not a factor behind the recent and projected growth in Canada's ethanol industry. Canada has the world's second largest proven oil reserves (estimated at 179.2 billion barrels) and is one of the top 10 oil-exporting countries in the world. According to the National Energy Board of Canada (NEB), in 2008, Canadian production of crude oil and equivalent averaged 2.7 million barrels (US liquid) per day, and represents a 2.5% increase over 2007. The NEB states that the rate of growth slowed in 2008 relative to 2007 due to downtime for maintenance and tying new facilities.

Table 3.1 Growth in Canadian Oil Production, Consumption and Net Exports*, 2002-2008; in '000 barrels per day							
	2002	2003	2004	2005	2006	2007	2008
Total Oil Production¹	2,950	3,110	3,135	3,092	3,287	3,422	3,353
% change		5%	1%	-1%	6%	4%	-2%
Total growth (2002-2008)							14%
Crude Oil Production²	2,171	2,306	2,398	2,369	2,525	2,616	2,593
% change		6%	4%	-1%	7%	4%	-1%
Total growth (2002-2008)							19%
Canadian Consumption³	2,078	2,207	2,300	2,345	2,297	2,364	2,318
% change		6%	4%	2%	-2%	3%	-2%
Total growth (2002-2008)							12%
Net Exports of Petroleum	871	903	836	795	990	1,058	1,035
% change		4%	-7%	-5%	25%	7%	-2%
Total growth (2002-2008)							19%
*expressed in liquid(l) barrels							
Source: Energy Information Agency, US Dept. of Energy							
¹ total oil production includes lease condensate, natural gas liquid, and other liquids, and refinery processing gain (loss). Negative values indicates refinery processing loss							
² includes lease condensate							
³ consumption of petroleum products and direct combustion of crude oil							

B. Energy Demand by the Transportation Sector

While Canada is a significant producer of oil, it also ranks among the world top 10 consumers of petroleum. As illustrated in Table 3.2, transportation, on average between years 2004 and 2008, accounted for nearly one quarter, 24-25% of total energy demand. Of that share, motor gasoline and diesel fuel oil account for 87% of the energy used (see Table 3.4). Based on data from the US Department of Energy, Canada decreased its consumption of petroleum in 2007 (see table 3.1), and this decrease in consumption is reflected in the reported drop in use in

industrial consumption of energy (reflection of the economic slowdown). In contrast, the level of consumption in the transportation industry in 2008 increased marginally from year 2007 levels. The NEB reports that this slight increase in consumption is due to growth in population and commercial sector but also the growth rate in energy consumption has slowed considerably from years 2006-2007 levels when Canadian increased their transportation energy consumption by 4%.

Table 3.2 Domestic Energy Consumption; in petajoules						
	2004	2005	2006	2007^(a)	2008^(a)	Change 07/08
Residential^(b)	1,421	1,403	1,347	1,448	1,466	1.2%
Commercial	1,468	1,493	1,425	1,471	1,499	1.9%
Industrial^{(b)(c)}	5,015	4,857	4,967	5,166	5,090	-1.5%
Transportation	2,483	2,519	2,514	2,616	2,624	0.3%
Total	10,387	10,272	10,253	10,701	10,679	-0.2%
(a) includes consumption of imported energy						
Source: National Energy Board						

A closer look at the use of energy within the transportation industry shows that on average for the last seven years, the share of energy used for freight averaged 40% per year and the share of energy used for passenger transportation averaged 56%.

Table 3.3 Energy Use by Transportation Sector; in petajoules							
	2000	2001	2002	2003	2004	2005	2006
Total Energy Use	2,282	2,277	2,306	2,362	2,465	2,501	2,492
Freight	947	898	892	938	1,002	1,028	1019
Passenger	1,255	1,291	1,323	1,331	1,368	1,376	1,374
Off road	80	89	92	93	95	97	100
	2000	2001	2002	2003	2004	2005	2006
Shares (%)							
Freight	41%	39%	39%	40%	41%	41%	41%
Passenger	55%	57%	57%	56%	55%	55%	55%
Off road	4%	4%	4%	4%	4%	4%	4%
* year 2006 is the year for which the most recent data is available							
Source: Office of Energy							

A breakdown of transportation energy use by fuel type reveals that gasoline and diesel fuel account for an average of 56% and 30%, respectively, of the fuel type used, and dominate as the transportation sector's main energy sources (see table 3.4).

Table 3.4 Transportation Sector Energy Use by Source; in petajoules					
	2002	2003	2004	2005	2006
Total Energy Use	2,306	2,362	2,465	2,501	2,492
Electricity	3	3	4	4	4
Natural Gas	2	2	2	2	2

Motor Gasoline	1,333	1,355	1,384	1,378	1,380
Diesel Fuel Oil	662	698	745	782	783
Light Fuel Oil and Kerosene	0	0	0	0	0
Heavy Fuel Oil	65	67	69	68	57
Aviation Gasoline	4	3	3	3	3
Aviation Turbo Fuel	225	223	246	256	253
Propane	12	12	13	10	12
Coal	0	0	0	0	0
Shares(%)	2002	2003	2004	2005	2006
Electricity	0.1%	0.1%	0.2%	0.2%	0.2%
Natural Gas	0.1%	0.1%	0.1%	0.1%	0.1%
Motor Gasoline	57.8%	57.4%	56.1%	55.1%	55.4%
Diesel Fuel Oil	28.7%	29.6%	30.2%	31.3%	31.4%
Light Fuel Oil and Kerosene	0.0%	0.0%	0.0%	0.0%	0.0%
Heavy Fuel Oil	2.8%	2.8%	2.8%	2.7%	2.3%
Aviation Gasoline	0.2%	0.1%	0.1%	0.1%	0.1%
Aviation Turbo Fuel	9.8%	9.4%	10.0%	10.2%	10.2%
Propane	0.5%	0.5%	0.5%	0.4%	0.5%
* year 2006 is the latest year for which data was available					
Source: Office of Energy					

C. Imports and Exports

The Canadian NEB estimates total crude oil exports at 1.79 million barrels (US liquid) per day, in 2008, which represents a less than 1% decrease from 2007 levels. According to the Energy Information Administration (EIA), Canada remained the largest exported to the United States for crude oil in 2008, ahead of both Saudi Arabia and Mexico.

Despite Canada's position as a net exporter of crude oil, much of the requirements of eastern refineries are met with foreign produced crude oil. In 2008, the NEB reported that crude oil imports decreased from 2007 levels by 2.3% to 840,000 barrels (U.S. liquid) per day, which represents 47% of total refinery feedstock requirements in Canada. Canadian oil production is unevenly distributed across Canada and results in Canada's eastern provinces, where most of the population is located, being net importers. Due to better transportation networks, imports, of which 59% originate from OPEC countries, 34% from the North Sea and 7% from NAFTA countries, help meet the requirements for the Atlantic region, Quebec, and Ontario. According to the NEB, Quebec was the largest regional importer of crude oil with 90% of their refining needs being supplied from international sources. The NEB also reports that refineries in Ontario are increasing their feedstock sourcing from Western Canada.

4. The Canadian Ethanol Industry

A. Ethanol Production and Distribution Capacities

Based on the trend of net sales of gasoline used for road motor vehicles over the past five years (see Table 4.1 below), a federal mandate of 5% renewable fuel content would require a

minimum of 1.9 billion liters.

Table 4.1							
Sales of Fuel Used for Road Motor Vehicles, Canada; in 1000 liters							
	2003	2004	2005	2006	2007	Average	06/07
Net sales of gasoline	38,421,608	38,911,752	38,484,324	38,653,955	39,640,225	38,822,373	2.55%
Net sales of diesel oil	14,720,634	15,671,144	16,216,420	16,611,819	17,196,304	16,083,264	3.52%
Source: Statistics Canada; 2007 year for which most recent data is available							

Should the projects under construction be realized, Canadian production is expected to reach 1.931 (see Table 4.2) billion liters by the end of 2010, a production capacity that meets the government of Canada's target of 1.9 billion liters. Current production capacity by the end of 2009 is expected to increase only slightly from 2008 levels due to the economic slowdown which has resulted in several construction plans for ethanol plants being delayed until oil prices recover and the economy improves. Production capacity is expected to reach 1.415 billion liters in 2009, a 1.8 percent increase compared to 2008 (1.39 billion liters). The anticipated increase is due to anticipated production from the North West Bio plant which is expected to come on line towards the end of 2009.

Table 4.2				
Fuel Ethanol Production Plant - Existing, Expanding, Under Construction				
Status	Location	Company Name	Primary Feedstock	Expected Capacity (million liters)
Existing	Varenes Quebec	GreenField Ethanol	corn	120
Existing	Westbury, Quebec	Enerkem	wood waste	5
Existing	Chatham, Ontario	GreenField Ethanol	corn	150
Existing	Ottawa, Ontario	Iogen	wheat straw	2
Existing	Sarnia, Ontario	Suncor Energy	corn	200
Existing	Tiverton, Ontario	GreenField Ethanol	corn	26
Existing	Johnstown, Ontario	GreenField Ethanol	corn	200
Existing	Collingwood, Ontario	Collingwood Ethanol	corn	50
Existing	Aylmer, Ontario	IGPC	corn	150
Existing	Minnedosa, Manitoba	Husky Energy	wheat, corn	130
Existing	Lloydminster, Saskatchewan	Husky Energy	wheat	130
Existing	Weyburn, Saskatchewan	NorAmra Bioenergy	wheat	25
Existing	Lanigan Saskatchewan	Poundmaker	wheat	12
Existing	Belle Plaine, Saskatchewan	Terra Grain Fuels	wheat	150
Existing	Red Deer, Alberta	Permolux	wheat	40
<i>Under construction</i>	St-Clair, Ontario (expansion of current plant)	Suncor	corn	200
<i>Under construction</i>	Havelock, Ontario	Kawartha Ethanol	corn	80
<i>Under</i>	Hensall, Ontario	GreenField Ethanol	corn	200

<i>construction</i>				
<i>Under construction</i>	Unity, Saskatchewan	North West Bio Energy	wheat	25
<i>Under construction</i>	Edmonton, Alberta	GreenField Ethanol/Enerkem Inc.	municipal landfill waste	36
1,931				TOTAL:
Source: Canadian Renewable Fuels Association				

In 2009, it is estimated that 69% of the production capacity for domestic ethanol will come from corn, 30% from wheat and 1% from "other" feedstocks such as wood waste and wheat straw. Post forecasts that this will likely change to 75% corn, 23% wheat and 2% "other" feedstock by the end of 2010 should the planned plants be in operation by the end of 2010. In 2009, Ontario alone is estimated to account for 56% of current domestic ethanol production capacity. Quebec is estimated to account for 9% of current domestic ethanol production capacity and the western provinces of Manitoba, Saskatchewan, and Alberta combined are estimated to account for 35% of domestic ethanol production capacity.

B. Canadian Ethanol Production Business Models

While the federal and provincial programs have been designed to encourage ethanol plants with greater agricultural producer/rural community equity or investment, Canadian ethanol is being produced by companies that range from (a) energy companies and energy marketers, to (b) companies which focus on grain-based ethanol production that often have some degree of producer equity/investment, to (c) co-operatives, to (d) companies focused on a range of activities such as grains, or other sources of renewable fuels. Only one multinational corporation, ADM, has involved itself in the production of Canadian ethanol. ADM has invested in Husky's large wheat-based ethanol production facility in Lloydminster, Saskatchewan. To date, multinationals have not expressed interest in Canadian produced ethanol, seeing Canada primarily as a market for US-produced ethanol. This may change now that the Canadian government has unveiled its new programs and production incentives.

Table 4.3	
Canadian Ethanol Producer Business Models	
Energy Producers and Marketers:	
	<u>Location / Primary Feedstock / Plant Capacity / Start-up</u>
Suncor Energy	Plant 1: Sarnia, Ontario / Corn / 200 million litres / 2006 Plant 2: St-Clair, Ontario / Corn / 200 million litres / 2010
Husky Energy	Plant 1: Minnedosa, Manitoba / Wheat, some corn / 130 million litres / 2007

	Plant 2: Lloydminster, Saskatchewan / Wheat / 130 million litres / 2006
Grain Based Ethanol Plants with Producer Equity:	
	<u>Location / Primary Feedstock / Plant Capacity / Start-up</u>
GreenField Ethanol	Plant 1: Varenes, Quebec / Corn / 120 million litres / 2007 Plant 2: Chatham, Ontario / Corn / 150 million litres / 1996 Plant 3: Tiverton, Ontario / 26 million litres / 1989 Plant 4: Johnstown, Ontario / Corn / 200 million litres / 2008 Plant 5: Hensall, Ontario / Corn / 200 million litres / 2010
Poundmaker	Lannigan, Saskatchewan / Wheat / 12 million litres / 1991
Terra Grain Fuels	Belle Plaine, Saskatchewan / Wheat / 150 million litres / 2008
IGPC	Aylmer, Ontario / Corn / 150 / 2008
Kawartha Ethanol	Havelock, Ontario / Corn / 80 million litres / 2010
North West Bio Energy	Unity, Saskatchewan / Wheat / 25 million litres / 2009
Renewable Fuels Companies:	
	<u>Location / Primary Feedstock / Plant Capacity / Start-up</u>
NorAmera Bioenergy	Weybur, Saskatchewan / Wheat / 25 million litres / 2005
Iogen	Ottawa, Ontario / Wheat straw / 2 million litres / 2004
Enerkem	Westbury, Quebec / Wood waste / 5 million litres / 2005
GreenField Ethanol/Enerkham Joint Venture	Edmonton, Alberta / Municipal landfill waste / 36 million litres / 2010

5. The Canadian Biodiesel Industry

A. Biodiesel Production and Distribution Capacities

The Canadian government's Notice of Intent anticipates that to reach its objective of a federal mandate of 2% renewable fuel content in diesel fuel, 600 million liters of diesel fuels will be required. Despite the Government of Canada's announcement that it intends to mandate renewable fuel content in diesel fuel, the growth in biodiesel production capacity has not increased significantly until very recently. A stronger driver of the increase in biodiesel

production capacity seems to be provincial mandates which are likely to be in force ahead of the federal mandate.

Table 5.1 Bio-diesel Production Plants (Current, Expanding, Under Construction)				
Start-up	Location	Company Name	Feedstock	Capacity (million liters)
2005	Montreal, Quebec	Rothsay	tallow	30
2008	St-Alexis-des-Monts, Quebec	Bio-Diesel Quebec Inc	yellow grease	10
1996	Foam Lake, Saskatchewan	Milligan Bio-tech	canola oil	1
2006	Hamilton, Ontario	BIOX Corporation	tallow, yellow grease, palm oil	66
2009	Winnipeg, Manitoba	Greenway Biodiesel	Canola	20
2005	Calgary, Alberta	Western Biodiesel Inc	Multiple feedstock	19
2009	Mississauga, Ontario	Methes Energies Canada	Multiple feedstock	5
2010 -under construction	Beausejour, Manitoba	Eastman Bio-Fuels	Canola	11
2009 -under construction	Arborg, Manitoba	Bifrost Bio-Blends	Canola	4
2009 -under construction	Lethbridge, Alberta	Kyoto Fuels	Tallow	66
2011 Feasibility Analysis Stage	Sturgeon, Alberta	Canadian Bioenergy	Canola	225
TOTAL:				457
Source: Canadian Renewable Fuels Association				

Canada's biodiesel production capacity by the end of 2009 is expected to reach 216 million liters, a 71% increase over the 2008 production capacity of 126 million liters. This is if the production from Bifrost Bio-Blends and Kyoto Fuels come online before the end of 2009 as anticipated. Even with the current plants, plants under construction and the potential 225 million liter Canada Bioenergy/ADM plant that is currently under consideration, the federal biodiesel mandate is unlikely to be met solely with domestic production. Future growth, of the Canadian biodiesel industry may be limited by the industry's ability to secure cheap feedstock. Most of the current and forecasted increase in biodiesel comes from rendered animal by-products and industry sources put a ceiling on potential production from rendered animal fats

at 250 million liters. High prices for oilseeds may hinder Canada's ability to supply the majority of the feedstock necessary for the balance of the volume required.

The federal government's new biofuel strategy programs are geared more towards ethanol and are therefore limited in their ability to address the limiting factors for biodiesel market growth. This has implications when trying to determine what the profitability for embarking on a biodiesel venture. For example, crushing plants can be used to produce oil for both bio-diesel production and human consumption, but the federal government does not want to inadvertently subsidize crushing capacity for oils destined for human consumption. Many investors, seeing the potential for bio-diesel, hope to cash in on the federal government's ecoABC Initiative, a program to assist in the construction of biofuel facilities that have a minimum of five percent producer investment. The Saskatchewan Bio-diesel Development Council raised a red flag when it warned biodiesel proponents that crushing components of bio-diesel ventures would not be eligible for the repayable contributions. The Saskatchewan Biodiesel Development Council is frustrated by this, arguing that this violates the equity in support that is supposed to exist between ethanol and biodiesel.

6. Import Regimes for Biofuels

Due to the North American Free Trade Agreement there is no tariff on renewable fuels produced in the United States and imported into Canada; however, Canada does have a tariff on ethanol imported from other countries such as Brazil (\$0.05 per liter).

While the current differences in provincial tax exemptions for renewable fuels do not greatly affect production decisions, the unlikely combination of lower oil prices (e.g. return to pre-2005 levels), and higher grain prices could make certain provincial tax-exemption restrictions obstacles to expanding the industry.

7. The Economics of Biofuel Production in Canada

The long-term viability of producing biofuels in Canada will depend on a multitude of factors including plant size, production types, co-products, feedstock costs, energy prices, and production/consumption incentives. The required increase in biofuel production set out by the federal mandate will necessitate a build up of infrastructure to support the industry.

A. Factors Affecting the Long-term Viability of a Canadian Biofuel Industry

A multitude of studies in Canada and elsewhere have been conducted on the cost of production for different plant sizes for ethanol production. Economic studies conducted in the United States have shown that there are large economies of scale in biofuel manufacturing. It was estimated that tripling of a plant size reduced capital costs by 40% and operating costs by 15-20%. All new Canadian ethanol plants under construction, with the exception of Collingwood

Ethanol and North West Bio Energy, are all large-scale facilities designed to capture these economies of scale. The eligibility limits outlined by the federal government production program is 200 million liters per year, production limits that Canadian plants currently are below.

The economic viability of biofuels depends on the value of co-products helps reduce per gallon costs of production for ethanol. Different milling processes produce different co-products. Wet milling processes can also produce corn oil, corn gluten meal, corn gluten feed, and carbon dioxide. Canada's smaller and earliest ethanol plants are wet milling plants. These plants, however, only produce wet distillers grains as co-products, since they do not meet the economies of scale needed to warrant the production and marketing of the other potential co-products. These plants produce wet distillers grains (DDGs) that are consumed by local cattle. Potential for large-scale wet milling plants is limited as the large cattle and dairy production does not take place in areas close enough to the ethanol plants due to transportation costs. It is for this reason that Canada's large scale plants are dry-milling plants for which the by-products are distillers dried grain, condensed syrup, and carbon dioxide. By drying the DDGs, it is possible to market this feed substitute to livestock markets that are further away. Possible market intervention by the Canadian Wheat Board may limit a plant's ability to extract full value for its co-product. Additional limiting factors for extracting full value from the co-products and ethanol include a lack of efficient distribution channels and infrastructure.

Infrastructure and shipping logistics of feedstocks, fuel-ethanol and its co-products are also factors that will affect Canadian competitiveness. With most refineries and most of the populations in the east, and much of the increase in biofuel production capacities occurring in the west, infrastructure and distribution issues become increasingly important. Industry sources see a short-to-medium term increase in rail usage. Proximity to railways has been important when choosing locations for ethanol plants. Ethanol feedstock, ethanol and ethanol co-products will however have to compete with other, perhaps higher priced goods. Rail connections with neighboring U.S. states may also increase. Any overseas deliveries of DDGs are being done via vessels and therefore necessitate getting the co-products to the coastlines economically.

The profit margins of ethanol production and its ability to compete with petroleum will continue to be affected by the energy-based inputs used in ethanol production and feedstock production. In 2009, while natural gas prices have fallen dramatically due to the global economic recession, feedstock prices remain high compared to historical averages. A resource for tracking the profitability margins of ethanol and biodiesel can be found at the following website: [Center for Agriculture and Rural Development](#). The same trend holds true for biodiesel that is made with vegetable oils such as soybean oil and canola oils.

B. Impacts of Ethanol Production on Feedstock Markets

Corn and wheat are the main feedstock for ethanol production in Canada and the introduction of the mandatory renewable fuel content by the Canadian government will undoubtedly have an impact on production patterns. At this time, there are no official statistics for the amount of corn and wheat directed into ethanol production. Table 7.1 provides estimates and forecasts on the quantity of corn and wheat that has and will be directed into ethanol production. ***These estimates are calculated from the point in time when plants have reached, or are expected to reach, full capacity*** (not based on plant production capacity on the start-up dates).

Table 7.1					
Quantity of Feedstock Used in Ethanol Production*; in MT					
	2006	2007	2008	2009(e)	2010(f)
Corn	701,040	1,183,640	1,390,523	2,384,806	3,604,006
Wheat	215,543	525,780	761,746	1,145,032	1,188,212
*estimates, does not include ethanol produced from municipal landfill waste, nor woody waste conversion factors: 1 bushel corn or wheat = 10 liters ethanol 1 bushel corn = .0254 MT 1 bushel of wheat = .021772 MT Calculated from when plants reach full production capacity					

(i) Ethanol Produced from Corn

Ontario is the largest corn-producing province in Canada and, not surprisingly, where 56% of the Canadian ethanol production takes place. Corn at this time, is the main feedstock for Canadian ethanol production. Corn production also takes place in Quebec.

Table 7.2					
Quantity of Corn Used for Feed, Ethanol Production; in 1,000 MT					
Year	Domestic Corn Production	Corn Imports¹	Corn Imports² from US	Corn for Feed³	Corn for Ethanol⁴
2005	9,361	2,155	2,150	7,830	560
2006	8,990	1,899	1,893	8,275	701
2007	11,649	3,117	3,105	8,900	1,184
2008	10,592	2,000	1,992	9,600	1,391
2009(f)	10,550	2,350	2,340	9,100	2,384
^{1,2} import data based on a calendar year, all corn excluding popping corn; source: Statistics Canada ^{3,4} no official statistics exist, estimates based on production in a <i>calendar year</i>					

Corn is estimated to account for 65% of the feedstock used in ethanol production in Canada in 2008. In 2009, and 2010, corn is expected to account for 68%, and 75% of ethanol feedstock, respectively, as more corn-based ethanol plants come online. In 2008, it is estimated that

1,391 thousand metric tons (TMT) of corn was directed into ethanol production. In 2009, it is estimated that 2,384 TMT of corn will be directed towards ethanol production, a 72% increase from 2008 levels. This increase in demand from the ethanol industry however is offset by a decrease in demand from Canada's shrinking livestock industry and therefore the corn plantings are expected to remain at the same level as in 2008. Canada is forecast to produce 10.6 million metric tons (MMT) of corn in 2009, and to import 2,350 TMT, mainly from the United States. The forecasted increase in corn imports is due to lower levels of domestic supply. With the forecasted expansion of the corn-based ethanol industry in 2010, the amount of corn required in 2010 is an estimated 3.604 MMT (see table 7.1), a 51% increase over the year 2009 requirements.

The increase in demand for corn by the ethanol plants, and Canada's limited corn-production capacity due to climatic factors will result in the feed and ethanol industry in Canada competing for corn. Many analysts say that this reduction in corn availability could be met with the ethanol by-product of DDRs. The Canadian livestock industry disagrees and has been very vocal on this issue, pointing to increases in feed costs as a reason for lower livestock output. Any shortfall in the ability to meet demand for corn domestically due to the re-direction of corn into ethanol use and away from feed will likely be met by imports of U.S. corn. However, the volume of potential increases in imports of U.S. corn will be mitigated by a shrinking Canadian livestock industry (and therefore a reduced demand for feed), the untapped corn growing capacities in Ontario and Quebec, high corn prices, and the ability to use feed corn substitutes for such as barley and DDGs.

(ii) Ethanol Produced from Wheat

Wheat is the feedstock for most of the balance of Canada's ethanol production. In 2008, it accounted for 35% of the feedstock, and is estimated to account for 32%, and 25% of the grain-based ethanol feedstock for years 2009, and 2010, respectively. The newer wheat ethanol plants have more flexibility built-in as the pipes are larger and allow the use of other feedstock, such as corn, when wheat feedstock may be too expensive. The Husky Energy's wheat-based ethanol plant in Minnedosa, Manitoba uses corn when wheat feedstock was unavailable or too expensive. However, Husky Energy has agreed that 80% of the feedstock used to produce ethanol will come from Manitoba producers. The agreement is with the Manitoba government and expires after 8 years.

Table 7.3					
Quantity of Wheat Used for Feed, Ethanol Production; in TMT					
	Domestic Wheat Production	Wheat Imports¹	Wheat Imports² from US	Wheat for Feed³	Wheat for Ethanol⁴
2005	26,775	18	17	5,056	150
2006	25,265	26	25	4,800	215

2007	20,054	25	23	4,000	526
2008	28,611	22	20	3,864	762
2009(f)	23,950	20	18	3,564	1,145
^{1,2} import data based on a calendar year and includes only HS code 1001; source: Statistics Canada					
^{3,4} not official statistics, estimates based on production in a <i>calendar year</i>					

As shown in Table 7.3, in 2009, it is estimated that 1,145 thousand metric tons (TMT) of wheat will be directed towards ethanol production, a 50% increase from year 2008 levels. Canada is forecast to produce 24.0 MMT of wheat in 2009, a 16.3% decrease from 2008 levels. By 2010, the openings of wheat-based ethanol plants in Western Canada will increase the demand of wheat destined for ethanol production to 1188 MMT (see Table 7.1), which represents a slight increase over the estimated 2009 wheat utilization for ethanol.

As the ethanol industry grows, demand for different wheat varieties is also expected to grow resulting in increased competition between wheat end-users, such as the Canadian ethanol producers, livestock producers and the milling industry. The need for high-yielding, low-protein wheat by the livestock industry and the ethanol plants are in direct conflict with the needs of the flour industry. Increases in ethanol efficient wheat is expected to affect production patterns and result in more Canadian wheat farmers seeding area to lower protein/high starch wheat such as Winter Wheat and Canadian Prairie Spring Wheat rather than higher protein/lower starch wheat varieties used by the milling industry. The livestock sector, especially the hog sector, competes for the same wheat varieties as the ethanol sector.

There are additional layers of complication when using wheat as a feedstock in ethanol production, depending on the co-products produced and the markets for which they are destined. The Canadian Wheat Board (CWB) controls the sales of wheat for human consumption and export and therefore as long as the ethanol is going to be used as fuel and the DDG's are going to be fed to livestock, the CWB has no involvement. If the plant fractionates the grain and it removes components that can be used for human consumption such as wheat gluten, then a portion of the wheat technically, has, to be purchased through the CWB. For the most part, ethanol plants purchase their wheat in the same way a feed mill does, either directly from farmers or from a grain company. While the CWB promotes industrial uses for its western-grown grains, its current position is that although its mandate allows it to enter the market for sales of wheat for ethanol production, it will not do so.

(iii) Ethanol Produced from Sugarcane or Sugar Beets

Canada does not produce ethanol from sugarcane or sugar beets, nor are there any expectations that it will on a large scale.

C. Impacts of Biodiesel Production on Feedstock Markets

(i) Biodiesel Produced from Canola and Animal Fats/Oils

With a 2% biodiesel mandate in place, the choice of feedstock comes into question. While biodiesel can be made from a variety of feedstocks, prices and availability are the determining factors of which one will be used. While canola, due to the abundance of the Canadian production, was thought to be the natural choice for feedstock, studies suggest that this may not be the case. Key competitors facing canola oil for use in biodiesel are rendered oils (yellow grease), rendered animal fats (tallow), palm oil (which would be imported as Canada does not produce palm oil), and soybean oil. Canola and soybeans are high priced feedstock for biodiesel since they are priced as food oils in the international markets while palm oil and rendered fats are priced at feed and industrial use levels.

Most of the growth in biodiesel production capacity has been taking place in Western Canada, spurred on by provincial mandates.

Table 7.4					
Quantity of Feedstock Used in Bio-diesel Production*; in million liters					
	2006	2007	2008	2009 (e)	2010(f)
Soybean oil	0	0	0	0	0
Rapeseed Oil	0,99	0,99	7,92	42,6	265,3
Palm Oil	0	0	0	0,0	0,0
Animal Fats	48,5	48,5	48,5	54,0	113,9
Recycled Vegetable Oil	65,3	70,3	75,2	90,1	90,1
*Conversion factor: 1 liter feedstock = 1.10 liters bio-diesel; Note: feedstock quantity calculated from point at which plant operates at full capacity					

Canola production has reached record high levels in recent years, and increased demand from canola oil for use as an oil in the food retail industry has resulted in higher prices. Canola producers have responded by planting record acres. Despite this supply response, some industry observers suggest that canola could remain too expensive, and that a 2% biodiesel blend could be met with cheaper feedstock. As the demand for the cheaper feedstock increases, so will their prices. This may result in canola being used to fill the void created in various markets such as the soap and chemical markets. Industry information indicates that a demand for 503 million liters of biodiesel could and will likely be met from yellow grease, tallow and imported palm oil as feedstock. In this scenario, canola oil use would remain mainly for food, with some going into soap and chemical production and feed and an even smaller amount going for export. In addition, canola may be used as an additive to biodiesel to help improve the flow and storability. Soybeans would be used exclusively for food use and tallow would be diverted from feed use into biodiesel.

While canola use for biodiesel by-itself may be expensive, the co-products from biodiesel

production may make the economics work. Canadian Bioenergy and ADM are currently conducting a feasibility analysis to determine if it would be profitable to build a large scale biodiesel plant using canola as a feedstock. The plant will likely also be producing glycerine as a co-product. Other co-products include meal to be used in animal feed. There are limits on the profitability using canola as a feedstock if by-products are part of the everyday production process. For example, off-seed canola may not be a suitable feedstock if the meal must be sold since meal from off-seed canola may not meet quality standards. Despite these limitations, co-products and the production capacity of the plants (it would be capable of supplying over 40% of the federal 2% biodiesel mandate), and Alberta and British Columbia's biodiesel mandates may make the economics will work, despite the new, higher level, of commodity prices.

D. Fuels Produced from Other Biomass

There has been growing interest and investment in producing bioenergy from sources other than the traditional grains of corn and wheat. There have been a series of announcements over the last year of joint ventures to make cellulosic ethanol and biogas. Two of the most significant announcements include the joint cellulosic ethanol ventures announced by GreenField Ethanol and Enerkem, as well as Iogen's plans to build a commercial scale cellulosic ethanol plant in Saskatchewan.

In 2008, GreenField Ethanol and Enerkem announced plans to built and operate a commercial cellulosic ethanol plant using Enerkem's technology. Enerkem, a Quebec-based gasification and catalysis technology company, has developed technology which converts biomass such as municipal solid waste and wood residue into cellulosic ethanol. In June 2008, the companies made the announcement that the plant would be built in Edmonton. The \$70 million facility will initially produce 36 million liters of biofuel a year. The City of Edmonton and the Government of Alberta through the Alberta Energy Research Institute are contributing \$20 million to the facility.

Biogas is also of increasing interest and investment. Two of the three bio-energy projects granted funding under Alberta's Biorefining Commercialization and Market Development Program and the Bio-energy Infrastructure Development Program are for the development of biogas as an alternative source of energy. Kingdom Farm Inc. received a significant grant to review the potential for bio-gas being applied to large scale Alberta hog operations. Highmark Renewables Research also received a significant grant to carry-out bio-gas feasibility study on a large scale dairy operation.

Most fuels derived from sources of biomass other than grains remain at the research level and have not yet reached commercialization. In Canada, especially in British Columbia and Quebec cellulosic ethanol produced from wood residues (wood waste) are of special interest. One

company that is moving forward quickly with the development of this technology is [Lignol Energy Corporation](#), a company which specializes in cellulosic ethanol and biorefining. Lignol announced the completion of its end-to-end production of cellulosic ethanol from its fully integrated industrial-scale biorefinery pilot plant in Burnaby, British Columbia in 2009. The start up phase commenced in April 2009 but remains a pilot project.

E. Potential Trade Impacts

As Canada continues to build its bio-fuel production capacity through its diverse federal and provincial programs/strategies, potential trade issues such as World Trade Organization (WTO) disciplines, biotechnology, and inter-provincial barriers that are contrary to the national treatment principle embodied in the WTO and the NAFTA may present policy complications.

Confrontations reflecting these concerns are likely still a long ways off as an international trade/market for ethanol and bio-diesel has yet to develop. In the meantime, Canada will be concentrating its efforts on building up the industry.

The possibility of significant volumes of ethanol trade, especially between the northwest U.S. and Western Canada (wheat-based ethanol to the United States and corn-based ethanol to Canada), is unlikely to develop in the short to medium term. This is due mainly to the fact that Canada does not have excess ethanol production capacity, which would permit exports being shipped to the United States. In addition, the transportation, distribution and infrastructure issues around ethanol trade have yet to be resolved.

No official trade statistics exist for either fuel-grade ethanol or biodiesel trade. However, industry statistics suggest that Canadian imports of fuel ethanol are exclusively from the United States, and for the 2002-2007 period, these imports hovered around 70-100 million liters a year.

Table 7.5				
Fuel Grade Ethanol Exports to U.S. from Canada				
(in Thousand Barrels)				
2004	2005	2006	2007	2008
148	77	196	58	83
Source: Energy Information Administration				

Canada does, however, provide trade statistics for industrial-grade ethanol. The bulk of industrial ethanol trade (HS 22.07.10 and 22.07.20) takes place with the United States (see Table 7.6 a,b, 7.7 a,b). In 2008, Canadian exports of denatured alcohol (ethanol that cannot be used for beverages nor for hospital use) was 17.1 million litres pure alcohol (MLPA) and 64% was destined for the U.S. market. Canadian exports of undenatured alcohol in 2008 were 37.8 MLPA, with 36% of those exports being sent to the United States.

Table 7.6a					
Canada Ethanol Exports (2003-2006); in '000 Liters Pure Alcohol					
HS code	Description	2005	2006	2007	2008
	Total Ethanol	35,439	57,413	58,683	54,860
220710	Undenatured	16,606	19,957	39,627	37,773
220720	Denatured	18,834	37,457	19,057	17,086
Source: World Trade Atlas, Statistics Canada					
Table 7.6b					
Canada Ethanol Exports to U.S. (2003-2006); in '000 Liters Pure Alcohol					
HS code	Description	2005	2006	2007	2008
	Total Ethanol	23,703	40,698	42,782	28,374
220710	Undenatured	9,867	8,460	27,824	17,499
220720	Denatured	13,836	32,238	14,958	10,875
Source: World Trade Atlas, Statistics Canada					

As illustrated in Table 7.7a,b, Canadian imports of denatured ethanol increased in 2008. Imports of undenatured ethanol dropped slightly to 22.1 MLPA in 2008 from 23.1 MLPA in 2007. Imports of undenatured ethanol from the U.S. increased slightly in 2008 rising to 17.1 from 15.145 MLPA in 2007.

Table 7.7a					
Canada Ethanol Imports (2004-2007); in 1,000 Litres Pure Alcohol					
HS code	Description	2005	2006	2007	2008
	Total Ethanol	152,058	100,325	553,792	594,706
220710	Undenatured	29,397	34,782	23,095	22,128
220720	Denatured	122,661	65,530	530,697	572,578
Source: World Trade Atlas, Statistics Canada					
Table 7.7b					
Canada Ethanol Imports from U.S. (2004-2007); in '000 Liters Pure Alcohol					
HS code	Description	2005	2006	2007	2008
	Total Ethanol	113,536	78,379	455,349	502,196
220710	Undenatured	21,809	26,385	15,145	17,120
220720	Denatured	91,726	51,994	440,267	485,077
Source: World Trade Atlas, Statistics Canada					

8. Conclusion

The federal government's biofuel strategy has resulted in increased biofuel production capacity in Canada. However, Canada's ability to compete in grain-based ethanol production with the United States or low-cost production countries without government subsidies and market intervention is limited. The long term-viability of the Canadian grain-based biofuels industry will depend on a multitude of factors including plant size, production types, co-products, feedstock costs, and energy prices. The increase in bio-fuel production required by the federal

mandate will necessitate a build up in infrastructure. Cellulosic ethanol provides an additional means of achieving the environmental objectives of the Canadian bio-fuel mandate, and while there seems to be increasing levels of investment in this technology, the technology remains at the pilot project levels.

More detailed trade statistics are needed to measure the trade developments of the bio-fuels market and the markets for the co-products. Canada's limited production capacity, both in the short and medium term suggests that Canada's entry into the global ethanol market is still quite distant. While the possibility of increased ethanol trade, especially between the northwest U.S. and Western Canada (wheat-ethanol to the United States and corn-based ethanol to Canada), is unlikely to develop in the short to medium term, there is an increasing amount of trade taking place in the co-products of ethanol production.